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ABSTRACT

Although research in episodic recall memory comparing younger and older adults, favors the younger adults, findings in semantic memory research are less consistent. To examine age differences in semantic and episodic memory recall, 72 young adults (mean age, 20.8) and 72 older adults (mean age 71) completed three memory tests under varied conditions: recall only, present all-recall all, and present half-recall half. The tests involved recalling the states in the United States, the countries in Africa, and the countries in Europe and South America. Subjects also completed a shortened version of the Wechsler Adult Intelligence Scale (WAIS) vocabulary subtest. A preliminary analysis of the results revealed no significant age differences. When the groups were categorized by WAIS performance and recall condition, verbal ability, not age, was found to be a good predictor of semantic memory performance. On the episodic task, neither age nor verbal ability were good predictors of recall from episodic memory. Further research with matched groups is needed to substantiate these findings. (BL)

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Recall from Semantic and Episodic Memory

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The single most common finding in episodic recall memory tasks comparing younger and older adults is that significant age differences are found favoring the younger adults. The typical episodic task involves a lab experiment wherein subjects are asked to study some (arbitrary) material and shortly thereafter they are asked to recall as much of that material as possible.

Tests of semantic memory, on the other hand, usually involve tasks like priming, naming objects, categorizing material, or generating semantic associates for a given set of words. Very often the dependent measure in these tasks is the latency to respond. These semantic tasks are less consistent in their findings regarding age differences than are the episodic tasks. However, we think it is fair to say that although older adults are often slower to respond than younger adults, a majority of the studies have found the pattern of responses to be very similar across adulthood. At least the similarities in processing are prevalent enough so that researchers not directly involved in the field of aging, and authors of texts on aging, often state that age differences are larger in episodic than in semantic memory tasks (e.g., Huyck & Hoyer, 1982, p. 142). As just one example, Tulving in his recent book on episodic memory (Tulving, 1983, pp. 74-75), states, albeit cautiously, that much of the research on aging and memory can be explained by a decline in the episodic memory system with age.

However, there are several limitations involved in drawing conclusions about age differences in semantic or episodic memory. The most obvious limitation is that the tasks used to test retrieval from semantic memory or episodic memory are very different in most cases. In addition, the materials

employed as stimuli in the two types of tasks are often quite different. And finally, when comparing younger and older adults it is important to control (or vary systematically) the amount of semantic information each group has available regarding the stimuli. This is obviously important in semantic tasks but it is also very important in episodic tasks. For example, Barrett and Wright (1981) have shown that when the stimuli are relatively more semantically meaningful to older adults than younger adults, the usual recall advantage favoring younger adults in an episodic task can actually be reversed. Yet very few studies either vary systematically or control the amount of semantic information available to subjects in episodic tasks.

For at least these obvious reasons, conclusions about age differences in semantic and episodic memory are tenuous. The present experiment is a preliminary attempt to alleviate some of these problems.

To eliminate the problem of episodic and semantic task similarity we chose recall tasks that we believe tap, to varying degrees, the semantic and episodic memory systems. To tap the semantic memory system we had subjects simply recall as many of the instances of an exhaustive category of items as possible. Because there was no presentation or study trial we assumed that this Recall Only task would tap only semantic memory. A second task involved presentation of all the instances of an exhaustive category of items and then asking for recall of all of the items. We call this the Present All-Recall All task. In this task, subjects could ignore the items during presentation, in which case performance would be predicted to be exactly the same as in the Recall Only condition. However, the presentation is likely to have two effects. a) if subjects cannot recall all the items perfectly without a

presentation, the prosentation should render some of the less accessible items in semantic memory more accessible; and b) if subjects do not know all of the instances of a category, the presentation may lead to some new episodic information being made available for recall. The episodic information will contribute only slightly to overall performance unless subjects know very few of the items in the category.

The third task we call the Present Half-Recall Half condition. In this task we presented subjects with half of the members of an exhaustive category of items for study and asked them to recall only the items presented. We believe this task to be largely episodic. If subjects are familiar with most of the items in the category then this task involves a restructuring of the information in semantic memory. In essence, subjects know too much because if they simply wrote down the items available in semantic memory they would write down more items than were presented. Alternatively, if subjects know very few of the items in the category this task involves organizing new information, again an episodic task.

We employed the same materials in all the tasks. The three categories of items were the states in the United States of America, the countries in both Europe and South America, and the countries in Africa. These three categories were chosen because they have approximately the same number of instances (about 50) and more importantly because they vary in the amount of information our subjects have about them. Our subjects were very familiar with the States, very unfamiliar with the countries in Africa, and had an intermediate degree of familiarity with the countries in Europe and South America.

We also measured the verbal ability of our subjects in this experiment. Several researchers (eg.g., Bowles & Poon, 1982; Cavanaugh, 1983; Hess, 1984) have recently reported that when subjects are grouped into those with high and low verbal ability, age differences are found only among those with low verbal ability. By measuring verbal ability we hoped to assess individual differences in semantic and episodic memory among older and younger adults.

Method

Subjects

The participants were 72 University of Minnesota undergraduates and 72 University of Minnesota alumni. The undergraduates had a mean age of 20.8 years and had 13.9 years of formal education of the average. The older adults averaged 71 years of age and 16.8 years of formal education.

Materials

The three categories of items to be recalled were the states in the United States of America (50 states), the countries in Africa (51 countries at the time of test), and the countries in Europe and South America (46 countries). These three categories were chosen because they vary in the amount of information the average subject possesses about each. Most of our subjects were very familiar with the states, very unfamiliar with the countries in Africa, and possessed an amount of information about Europe and South America intermediate to the other two areas.

Each subject was given the following memory tests: a) one half the items from one category were presented for study and subjects were then asked to recall as many of the items presented as possible (Present Half-Recall Half); b) all of the items from another category were presented and then a recall

test for all the items in the category was given (Present All-Recall All); and c) no study trial was given for the remaining category of items--subjects were asked to recall the items from their existing knowledge (Recall Only).

Thirty-six groups of subjects (one male and one female from each age group) were formed to completely counterbalance the number and order of test-category combinations. Each group of subjects received a different randomization of items in the Present All-Recall All and the Present Half-Recall Half conditions.

Procedure

Participants were tested singly or in pairs. They were initially asked to complete a background questionnaire. They were then asked to complete the three memory tests. Subjects were told the exact nature of each test before it was administered. They were also told the number of items in each category before the testing began.

In the Present All-Recall All and in the Present Half-Recall Half conditions, the names of the countries or states were projected via a slide projector to a white wall approximately two meters in front of the subjects. The interstimulus interval was 4 seconds. After presentation of the items subjects were required to count backwards by 3's from a predetermined number for 20 seconds. This was done to clear short-term store so that these conditions would be comparable to the Recall Only condition.

Subjects were allowed 10 minutes for recall when all items from a category were to be recalled and 5 minutes when half of the items from a category were to be recalled. Responses were handwritten on numbered response sheets.

Subjects were also asked to complete a shortened version of the WAIS vocabulary subtest (items 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, and 26-35). Responses were collected in a written format.

Results

A preliminary analysis comparing younger and older adults on these tasks revealed no significant age differences. In fact, there was a slight trend (non-significant) towards better performance for the older adults. However, an examination of the WAIS scores is informative in this regard. We happened to sample a unique group of older adults. The mean score on the WAIS test was 34 for the older adults and only 25 for the younger adults.

For purposes of further analyses we therefore sorted subjects into a group with scores of 29 or above and labeled them high verbal subjects, and a group with scores of 23 or lower and labeled them low verbal subjects. There were no older subjects in the low verbal group. Subjects with scores between 24 and 28 were eliminated from further analyses.

The WAIS scores from the remaining three groups are given in Table 1. This procedure resulted in a younger and an older group very comparable in terms of WAIS scores and a younger group with much lower scores. A one-way analysis of variance on the three groups was significant ($F[2, 113] = 235.32$, $p < .001$) and planned comparisons revealed no significant differences between the older and younger high verbal groups ($p > .05$) and both groups had significantly higher scores than the low verbal younger adults (both p's $<$ .001)

Insert Table 1 about here

The results from the Recall Only condition (our semantic task) are given in Table 2. An analysis of variance on these data revealed main effects of group ($F[2, 107] = 16.17$, $p < .001$) and category ($F[2, 107] = 260.76$, $p < .001$) but no interaction ($F[4, 107] = 2.05$, $p > .05$). Simple effects tests showed that recall from the states was better than recall from the countries of Europe and South America ($p < .001$) which in turn was better than recall from the countries in Africa ($p < .001$). Additionally, the younger high verbal group was equivalent in performance to the older high verbal group ($p > .10$), and both high verbal groups were better than the younger low verbal group (both p's $< .001$).

Insert Table 2 about here

In sum, on this semantic memory task we found that verbal ability is a good predictor of semantic memory performance and that age (at least among high verbal subjects) is not a good predictor of semantic memory performance.

These conclusions are strengthened when examining the results from the Present All-Recall All conditions given in Table 3. Remember that we have argued that this task is also primarily a semantic task. The analysis of variance on these data also revealed main effects of group and category ($F[2, 107] = 13.25$, $p < .001$ and $F[2, 107] = 147.42$, $p < .001$, respectively) and no significant interaction ($F = .63$). Simple effects tests again revealed that the two high verbal groups did not differ ($p > .10$) and both outperformed the low verbal group (both p's $< .001$).

Insert Table 3 about here

Again the conclusions we draw are that: (a) verbal ability is a good predictor of semantic memory performance; and (b) age (at least when comparing high verbal ability subjects) is not a good predictor of semantic memory performance.

The results from the Present Half-Recall Half conditions (our episodic task) are given in Table 4. The analysis of variance again revealed a main affect of category ($F[2, 107] = 51.32$, $p < .001$). However, there was no main affect of group ($F = 1.50$) and no interaction between group and category ($F = 1.31$). Taken at face value these results suggest that neither age nor verbal ability are good predictors of recall from episodic memory. However, we interpret these results with caution. First, it is wise to accept conclusions based on accepting the null hypothesis with caution. But perhaps more importantly, there are trends in the data indicating that a more powerful study might find significant differences in episodic memory when degree of verbal ability is controlled. For example, even though the difference is not significant, the ordering in performance on the episodic task is younger high verbal, older high verbal, and younger low verbal. As one more example, take the case of recall of the countries in Africa (our least semantic task). Even though the high verbal groups appear to have a similar amount of semantic information, the younger high verbal group improves more on the episodic tasks than does the older group.

Insert Table 4 about here

The recognition data are given in Table 5. One might expect that recognition tests are more sensitive measures of episodically encoded information than recall tests and therefore if there were age differences when verbal ability is controlled for, they would be revealed in the recognition results. There were no group difference ($F = .78$) or category by group interactions ($F = .59$) in the recognition data. However, recognition performance is a measure of the discriminability between the targets and distractors. If the high verbal groups have more semantic information than the low verbal groups, then the distractors may be more familiar to the high verbal group and thus reduce any advantage of better encoding. In any case, there is no evidence from this recognition test that either age or verbal ability is a good predictor of episodic memory performance.

Insert Table 5 about here

Discussion

Although our conclusions must be viewed with caution because we did not match subjects on verbal ability and we did not have a low verbal older group, we believe that the results are suggestive.

First, in accord with other recent literature we found verbal ability to be an important individual difference variable in memory research. In the present experiment verbal ability was a much better predictor of semantic memory performance than was age.

Second, the amount of semantic information available about the stimuli is also an extremely important variable to consider in all memory tasks, including episodic memory tasks.

Finally, the fact the different patterns of results were obtained in the episodic and semantic tasks suggest that the distinction may be a useful one for further research in the field of aging.

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Table 1

WAIS Vocabulary Scores

(Maximum = 40)

	Mean	STD	
Older High Verbal	34.09	2.87	(n = 68)
Younger High Verbal	33.00	3.18	(n = 24)
Younger Low Verbal	19.58	2.50	(n = 24)

Table 2

Proportion of Items Correctly Recalled in Recall Only Conditions

Group	Category			
	United States	Europe & So. America	Africa	Average
Older High Verbal	.87	.59	.17	.54
Younger High Verbal	.90	.51	.16	.52
Younger Low Verbal	.82	.30	.03	.37

Table 3

Proportion of Items Correctly Recalled

in Present A.1 - Recall All Conditions

Group	Category			
	United States	Europe & S. America	Africa	Average
Older High Verbal	.89	.71	.30	.63
Younger High Verbal	.90	.65	.34	.65
Younger Low Verbal	.78	.48	.19	.51

Table 4

Proportion of Items Correctly Recalled

In Present Half - Recall Half Conditions

Group	Category			
	United States	Europe & So. America	Africa	Average
Older High Verbal	.72	.63	.38	.58
Younger High Verbal	.77	.64	.44	.61
Younger Low Verbal	.78	.52	.31	.52

Table 5

Recognition Performance (d')

Group	Category			
	United States	Europe & So. America	Africa	Average
Older High Verbal	2.57	2.44	1.86	2.30
Younger High Verbal	2.56	2.85	1.92	2.40
Younger Low Verbal	2.56	2.08	1.85	2.13